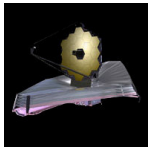

5553 - The first changing-multiplicity lensed quasar: a subparsec-scale probe of a quasar at Cosmic Noon

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Cameron Lemon (PI) (ESA Member)	**Oskar Klein Centre, Stockholm University**
Dr. Neal J. Jackson (CoI) (ESA Member)	University of Manchester
Prof. Timo Anguita (CoI)	Universidad Andres Bello
Prof. Frederic Courbin (CoI) (ESA Member)	Ecole Polytechnique Federale de Lausanne
Dr. Dominique Sluse (CoI) (ESA Member)	Université de Liège
Prof. Anna Nierenberg (CoI) (US Admin CoI)	University of California - Merced
Mr. Frederic Dux (CoI) (ESA Member)	Ecole Polytechnique Federale de Lausanne

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRSPEC PSJ2107-1611				
	1		NIRSpec IFU Spectroscopy	(1) PSJ2107-1611

ABSTRACT

A standard scheme for quasar structure has been built up over the last 60 years, comprising a supermassive black hole, accretion disk, torus, and broad and narrow line regions. However, constraining these regions' kinematics and geometry remains difficult, particularly at high redshift, where all studies are unresolved. A recent discovery of a quadruply imaged lensed quasar has opened up an unprecedented and exciting probe of the subparsec-scale geometry of a quasar at z=2.7. The system shows four point sources in the optical (to 0.93 microns), yet only two point sources in recent JWST-MIRI imaging (5.6 microns), and follow-up ERIS-NIX Ks imaging (2.1 microns). This is entirely unexpected since lensing is achromatic, but could be explained by the source lying within a parsec of the region that splits the four- and two-image regions. However, there are

still several unanswered questions. How is the rest-frame UV of the accretion disk imaged four times, yet its optical emission is not? How can parts of the broad line region be imaged four times, yet the torus, thought to be larger in extent, is not. A full UV to optical rest-frame spectrum is needed to map the various components to the source plane. We therefore propose JWST NIRSpec IFU observations to cover this range. The complete UV-optical spectrum of each quasar image will show when and how the images disappear, provide the first high-resolution image of the rest-frame UV, and probe key emission lines including MgII, H-beta, OIII, and H-alpha. Through detailed lens modelling, we will physically map the accretion disk, broad line region components, and torus, constraining their sizes, locations, and even shapes.

OBSERVING DESCRIPTION

We will target a gravitationally lensed quasar, which consists of four point sources surrounding a lensing galaxy. There is also a bright extended arc between and on top of the point sources, from the lensed quasar host galaxy. We will use NIRSpec IFU with the goal of obtaining spectra over the rest-frame optical (i.e. 0.97-3.07 microns observed frame) of this source. We cannot include the entire system within the field of view, and so will leave the most isolated image out of the FoV, while still probing three images, the lensing galaxy, and the host galaxy arc. We will employ two filter/disperser combinations to cover the wavelength range of interest, specifically G140M/F100LP and G235M/F170LP, with the NIRSIRS2 readout pattern, and a 4-point dither for each observation.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	PSJ2107-1611	RA: 21 07 52.3700 (316.9682083d) Dec: -16 11 33.14 (-16.19254d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Quasars]
Extended=YES

Observation

Proposal 5553, Observation 1

Tue Aug 13 16:00:44 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: PA requirement needed to fit three lensed images into the IFU FOV.

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	PSJ2107-1611	RA: 21 07 52.3700 (316.9682083d) Dec: -16 11 33.14 (-16.19254d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Quasars]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140M/F100LP	NRSIRS2	10	1	false	true	NONE	4	4	2976.134	178079
2	G235M/F170LP	NRSIRS2	10	1	false	true	NONE	4	4	2976.134	178079

Special Requirements

Aperture PA Range 198.97164917 to 210.97164917 Degrees (V3 60.0 to 72.0)